

WHAT IS CLAIMED IS:

1. In a helicopter of the type having a helicopter turbine engine mounted in the helicopter, the improvement comprising an over-stress protection system including:

data storage means and means for inputting a safe temperature profile for starting the helicopter turbine engine;

means for measuring the actual temperature during start up of the helicopter turbine engine;

comparison means for producing a signal when the actual engine temperature during an engine start up falls outside of the safe temperature profile; and

a source of water and/or alcohol and means for injecting a predetermined amount of water and/or alcohol into the turbine engine during the engine start up procedure in response to said signal.

2. In a helicopter in accordance with Claim 1 in which the helicopter includes a water tank disposed or mounted in said helicopter.

3. In a helicopter in accordance with Claim 1 in which a ground source of water and/or alcohol provides the water and/or alcohol for injection into the engine.

4. In a helicopter of the type having a helicopter turbine engine mounted within the helicopter, the improvement comprising an airborne tank for containing a supply of water and/or alcohol and an inlet for receiving a supply of water and/or alcohol from a ground based source, means for injecting water and/or alcohol into the helicopter turbine engine during a start up procedure while maintaining the airborne tank full of water or alcohol, means for disconnecting the supply of water or alcohol from the ground based source upon completion of the start up procedure and means for injecting water and/or alcohol from the airborne tank into the turbine engine in response to an engine over-stress during flight operations.

5. A method for starting a helicopter turbine engine and avoiding an over-stressed condition comprising the steps of:

- providing a safe temperature profile for starting the helicopter turbine engine;
- measuring an actual turbine outlet temperature during a start up of the turbine engine;
- comparing the actual turbine outlet temperature and the safe temperature profile; and
- injecting water and/or alcohol into the helicopter turbine engine when the actual temperature falls outside of the safe temperature profile.

6. A method for protecting a helicopter turbine engine against over-stress during start up and flight operations, said method comprising the steps of:

- providing an airborne tank for containing a supply of water and/or alcohol and an inlet for receiving a supply of water and/or alcohol from a ground based source;
- injecting water and/or alcohol into the helicopter turbine engine during a start up procedure while maintaining the airborne tank full of water and/or alcohol;
- disconnecting the inlet from the ground based source of water after start up of the helicopter; and
- injecting water and/or alcohol from the airborne tank into the helicopter turbine engine in response to an engine over-stress during flight operations.

7. A method for protecting a helicopter turbine engine against over-stress during start up and flight operations in accordance with Claim 6 which includes the step of controlling the amount of water and/or alcohol injected into the helicopter turbine engine during the start up procedure.

8. A method for protecting a helicopter turbine engine against over-stress during start up and flight operations in accordance with Claim 7 which includes the step of controlling the amount of water and/or alcohol injected into the helicopter turbine engine during flight operations.

9. A method for protecting a helicopter turbine engine against over-stress during start up and flight operations in accordance with Claim 8 in which water and/or alcohol is injected in response to an increase in turbine outlet temperature.

10. A method for protecting a helicopter turbine engine against over-stress during start up and flight operations in accordance with Claim 9 which includes the step of bypassing the airborne tank during an injection of water and/or alcohol during a start up procedure.

11. A helicopter turbine engine over-stress protection system comprising:
a helicopter;
a helicopter turbine engine mounted in said helicopter;
an airborne tank for containing water and/or alcohol disposed within said helicopter and an inlet for receiving water and/or alcohol from a ground source of water and/or alcohol;
data storage means and means for inputting a safe temperature profile for starting the helicopter turbine engine;
means for measuring the actual engine temperature during start up of a helicopter turbine engine;
means for sensing at least one critical operating parameter during flight operations;
comparison means for producing a signal when the actual engine temperature falls outside of the safe engine temperature profile during start up of the engine;
means for injecting water and/or alcohol into the helicopter engine during a start up procedure while maintaining said airborne tank full of water and/or alcohol;
means for disconnecting the supply of water and/or alcohol from the ground based source after completion of the start up procedure; and
means for injecting water and/or alcohol from said airborne tank into the turbine engine in response to an over-stress during flight operations.

12. A helicopter turbine engine over-stress protection system in accordance with Claim 11 in which said injection means automatically injects water and/or alcohol into said turbine engine in response to an engine over-stress during flight operations.

13. A helicopter turbine engine over-stress protection system in accordance with Claim 11 in which said inlet is separate from said airborne tank.

14. A helicopter turbine engine “hot start” prevention system comprising:
a helicopter;
a helicopter turbine engine mounted in said helicopter;
means for selecting a first preselected temperature and a ten second transient temperature range;
means for detecting a turbine outlet temperature of said engine;
a source of water and/or alcohol for injection into said turbine engine;
means for injecting water and/or alcohol from said source into said engine
when said turbine outlet temperature exceeds said first preselected temperature; and
means to abort said start up procedure if the turbine outlet temperature fails to fall below the ten second transient temperature range after injection of water and/or alcohol.